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Conclusions

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Whenever there is a European Parliamentary Technology Assessment (EPTA) meeting, such as this one, held at the Parliament of Catalonia on 23 October 2012 ('From Genes to Jeans: Challenges on the Road to Personalised Medicine'), the audience is a complex mixture. These meetings are attended by scientists, members of parliaments, and representatives of the advisory boards of the various EPTA organizations, who may or may not be scientists. Consequently, EPTA meetings bring together a diversity of approaches, views, and outlooks.

As a member of the Institute for Catalan Studies, the catalan academy of sciences and humanities, I am well aware that the strength of a culture, of a language, of a country, does not depend on the number of square kilometers that it spans or on the size of its population. Rather, it is based mainly on the strength of the fruits of that culture and its language. As Catalans we are another culture in west Mediterranean Europe of the 21st century. Núria de Gispert, president of the Parliament of Catalonia voiced these sentiments in her introduction to this meeting. Ours is an old country and merits the same rights as Germany, Italy, or Spain. We have our own language, and our roots in the Mediterranean can be traced back over centuries. As a crosswalk of civilizations throughout our history, we are an open people. We are also Europeans and we will go together with all of you, the peoples of Europe.

After the wealth of information presented during this 2012 EPTA meeting focusing on personalised medicine, it is a difficult task to briefly summarize the conclusions of the many expert speakers. The term *personalised medicine* refers to the application of genomic and molecular data to patients in order to establish the correct diagnosis and the most suitable treatment for each person. The main challenge to implementing personalised medicine is its complexity. Healthcare systems are already overwhelmed; but their sustainability is possible only if they are able to make the transition from data collection to data integration. In the common clinical practice, the skilled physician already applies personalised medicine to each patient, treating him or her as a unique individual. Indeed, despite the many technological advancements that facilitate the generation of a plethora of biochemical and physiological data, in daily clinical practice medical treatment has always been personalised.

While considering recent technological advances, it is a good idea to remember Lewis Thomas (1913–1993), author of *The Lives of a Cell*, and *The Medusa and the Snail*, among other books. He held appointments at several medical schools and hospitals and ended his professional career serving as the chancellor of the Memorial Sloan-Kettering Cancer Center, in New York City. In *The Youngest Science* (1983), he recalls how he became acquainted with the medical daily work by accompanying his father, a general practitioner in Long Island, in the 1920s. The senior Dr. Thomas made unending house calls and wrote his prescriptions in Latin. By the time his son Lewis attended medical school, in the 1930s, medicine had changed and was no longer a practice but was rapidly becoming a hard science. And by the 1990s, when Lewis Thomas died, the science of medicine had changed beyond recognition, with the diagnosis, treatment, and cure of many diseases that were previously deemed intractable. He remembers his father saying: "Medicine always tries to cure by attending to the particular biological characteristics. No patient is the same as another." This way of thinking, of seeing the patient as an individual, has a long tradition in medicine and it must be maintained, regardless of technological advances.

The main objective of personalised medicine in the modern genomics era is the study of the individual genetic variability, the predisposition of a patient to a particular disease, and his or her response to the pharmacological agents used in the treatment. The ideal drug, one that is effective in every patient, does not exist. For a physician, it can be difficult to assume the efficacy of a drug or a given dose in one patient because the patient has the 'same' health disorder or 'similar' symptoms as another patient; forgetting this fact may be not only inadequate but even harmful. In many cases, the lack of efficiency of a particular drug is caused by the patient's genetic characteristics, which determine the drug's absorption, metabolism, and excretion. In the next few decades, clinical medicine, with its growing focus on patient-tailored treatments, will increasingly need to take these factors into account.

The development of methodologies that allow the rapid and inexpensive sequencing of individual genomes allows us to think that personalised medicine will soon become a reality. Two of the many anticipated benefits are sparing patients ineffective treatments and avoiding adverse side effects. Consequently, we will avoid unnecessary suffering as well as higher healthcare costs. This aspect was commonly pointed out by many of the speakers at this meeting. Also frequently noted was that the successful implementation of personalised medicine would only be possible with continuous research efforts in all the new '-omics' sciences.

Pharmacogenetics and, more widely, pharmacogenomics are the sciences upon which personalised medicine will be based. The most important changes in the development of new drugs will be linked to the necessity of simultaneously developing a diagnostic assay and a targeted treatment. Fulfilment of the promises of pharmacogenomics has implications far beyond purely the scientific ones; it will require a radical change in the way medicine is currently practiced.

The synergy of pharmacogenomics, biotechnology, and regulatory approaches should be considered an asset if personalised medicine is to succeed. Furthermore, the ethical, legal, and social consequences must be fully recognized, and

fulfilled. There is also an urgent necessity for both public and private investment, and collaboration between the two. We live in a complex networking society in which the functioning of each node depends on that of the others.

I would like to end these brief comments with a quote by André Gide's (1869–1951) that was mentioned in one of the lectures: "*Toutes choses sont dites déjà, mais comme personne n'écoute, il faut toujours recommencer*." (Everything is already said, but since no one was listening, everything must be said again.) There are many challenges both in the introduction of innovations into the healthcare system and in their long-term adoption. But, as the confused married woman in Woody Allen's *To Rome with Love* (2012), who, when faced with temptation, says: "If I try, perhaps I will be sorry for some time, but if I don't try, I will be sorry forever," personalised medicine is definitely an enterprise worth trying. And it is also a challenge for all EPTA members who attended this meeting. Let us go forward, spread the news, and, when we meet again in Finland next year, discuss the insights and experience we have gained here and now.